



CareerMate AI: An AI-Driven Real-Time Interview Assistance System Using Behavioral and Visual Cues

¹ Sneha Bondugula, ² S. Ramchandra Reddy, ³ Ravi Bukya, ⁴ N. Sai Siddartha, ⁵ V. Girish Kumar, ⁶ V. Sai Laxman Kumar

^{1,4,5,6} Student, Department of Artificial Intelligence and Data Science, Nalla Malla Reddy Engineering College, Hyderabad, India

^{2,3} Assistant Professor, Department of Artificial Intelligence and Data Science, Nalla Malla Reddy Engineering College, Hyderabad, India

Email - ¹snehabondugula@gmail.com, ²rcreddy79@gmail.com, ³drravibukya@gmail.com, ⁴s9347737594@gmail.com, ⁵veerallagirishkumar@gmail.com, ⁶sailaxmankumar.vemula@gmail.com

Abstract: Job seeking in a restructured competitive employment field is very much dependent upon how well prepared the individuals are for interviews. Conventional interview methods may not be personalized, doesn't provide instantaneous feedback or be readily available. To solve such problems, this paper introduces CareerMate AI a multimodal AI-based interview preparation system that evaluates candidates using NLP, computer vision, and speech analysis. It provides real-time feedback based on responses, behavior, and communication skills that help users improve interview performance effectively. The system developed uses techniques based on NLP, facial expression recognition and speech processing. It provides real-time feedback, AI-generated questions (both HR as well as technical) based on resume or job description and grades answers based on relevance, grammar and semantic accuracy. The system recognizes behavioral signals such as eye contact and body language, in addition to vocal characteristics including tone fluctuations, fluency and confidence. The automated scoring system offers organized and impartial assessments, while dedicated feedback reports assist users in recognizing their strengths and weaknesses. The platform is user-friendly and provides scalability for real-world interview preparation scenarios. CareerMate AI improves users' confidence, fluency, and response relevance before they enter real interviews.

Key Words: Artificial Intelligence, Mock Interview System, Interview Chatbot, Career Preparation, Natural Language Processing, Computer Vision.

1. INTRODUCTION:

An interview is an important parameter of the selection process, and regardless of the field, such as academics, services or any organisation, one's technical skills are measured along with their problem-solving ability, communication skills and confidence. Experience does not mean that one can interview well, however, many candidates find it very difficult to perform effectively in interviews due to lack of practice, nervousness (often raised by the inappropriate feedback they get from their friends rather than an interview coach), etc. Existing techniques of preparing for an interview, like studying and practicing with friends in mock interviews, do not always deliver a real-world experience or personalized feedback. With the rapid development of Artificial Intelligence (AI), intelligent systems are more and more being employed in some areas, just like the education industry, HR management and career development. AI mediated platform can analyse user inputs, modify contents in a dynamic way and feedbacks are real-time; which makes it highly compatible with interview preparation applications. However, the current interview preparation tools are narrow in feature area and do not integrate other career assistance features.

In this paper, we present an AI-based career preparation and interview support platform that mimics real-world HR and technical interviews based on smart question generation and answer evaluation. The solution is built to fill that gap between academic understanding and actual interview practice, with personalized feedback and performance insights. The platform has been built with an eye on expandability that lets it be linked to AI interview chatbots, job discovery modules and in-app job application features. The proposed approach is scalable, fast, and effective approach to interview preparation especially for students and job seekers.



2. LITERATURE REVIEW:

Artificial Intelligence has significantly transformed interview preparation by enabling automated, scalable, and adaptive evaluation systems. Early and recent works focus on leveraging Natural Language Processing (NLP) and machine learning to simulate interview environments.

Chavan and Jadhav (2026) proposed an AI-based mock interview system that utilizes NLP for resume parsing and dynamic question generation. Their system adapts questions based on candidate responses and provides structured feedback, improving personalization in interview preparation. However, the evaluation is primarily text-centric and lacks integration of non-verbal cues.

Similarly, Koshti et al. (2025) introduced an AI-powered interview preparation system integrating resume analysis, HR simulation, and technical skill assessment. The system enhances candidate readiness through multi-domain evaluation. Despite its broader scope, the approach still lacks deep multimodal analysis, particularly in visual and behavioral dimensions.

Sahu et al. (2025) explored the use of generative AI to create adaptive interview environments, where follow-up questions are dynamically generated based on user responses. This improves realism and adaptability but does not provide a structured evaluation framework incorporating behavioral insights.

Chatbot-driven systems have emerged as interactive tools for simulating real-time interview scenarios. These systems enhance user engagement by enabling conversational practice and iterative learning.

Jain et al. (2024) developed an AI interviewer chatbot capable of conducting both HR and technical interviews. The system facilitates interactive dialogue using NLP techniques, allowing users to practice responses in a conversational setting. However, it lacks robust mechanisms for evaluating answer quality, confidence, and behavioral aspects.

Xiao et al. (2020) introduced interview chatbots with active listening capabilities, emphasizing the importance of contextual understanding and adaptive questioning. Their study highlights improved user experience and engagement but focuses more on interaction quality than performance evaluation.

Samrose and Hoque (2022) proposed MIA, a motivational interviewing agent designed to improve conversational skills in group discussions. Their work demonstrates the effectiveness of AI agents in enhancing communication skills, but it is not specifically tailored for structured interview evaluation.

Non-verbal communication plays a critical role in interview performance. Recent research emphasizes the importance of integrating multimodal data, including facial expressions, speech patterns, and physiological signals.

Agrawal et al. (2020) proposed a multimodal behavioral analytics framework for automated interview assessment, combining visual, audio, and textual features. Their findings demonstrate that multimodal fusion significantly improves evaluation accuracy compared to unimodal systems.

Suen et al. (2020, 2021) developed intelligent video interview agents capable of predicting communication skills and personality traits using visual and behavioral cues. These systems highlight the importance of facial expressions and body language in assessing candidate performance.

Rasipuram and Jayagopi (2018) focused on automatic assessment of communication skills using multimodal interaction data, showing that speech and behavioral features can effectively predict interview performance.

Poria et al. (2017) provided a comprehensive review of affective computing, emphasizing the transition from unimodal to multimodal systems. Their work highlights the importance of integrating diverse data sources for accurate emotion recognition.

Schuller et al. (2013, 2018) contributed foundational work in paralinguistics and speech-based emotion analysis, demonstrating the role of vocal features in understanding human affect and communication.

Emotion recognition and confidence assessment are critical components of interview evaluation systems.

Rai et al. (2024) and Kumar et al. (2022) developed AI-based interview evaluators that classify candidate emotions and confidence levels using machine learning models. These systems demonstrate the importance of emotional intelligence in interview performance assessment.

3. OBJECTIVES:

The main goal of this project is to build an intelligent and interactive interview preparation system that helps candidates improve their performance through real-time evaluation and meaningful feedback.

To achieve this, the project focuses on the following objectives:

- To design and develop an AI-powered interview assistance system that can simulate real-world interview situations, allowing users to practice effectively in a realistic environment.
- To create a dynamic question generation system that adapts based on the user's resume or job description, ensuring a personalized and relevant interview experience.



- To use Natural Language Processing (NLP) techniques to analyze user responses, evaluating them for accuracy, relevance, and clarity of expression.
- To incorporate computer vision techniques for analyzing behavioral and visual cues such as confidence, eye contact, and facial expressions during the interview.
- To develop a speech analysis module that evaluates communication skills, including fluency, tone, pauses, and overall clarity.
- To implement a weighted scoring system that combines different evaluation factors to produce a comprehensive performance score.
- To provide real-time feedback and detailed insights, helping users understand their strengths, identify weaknesses, and improve effectively.
- To design a scalable and modular system architecture that can be easily extended in the future with features like chatbot integration and job recommendation systems.
- To enhance user engagement by integrating AI avatar-based interaction (using platforms like AKOOL), creating a more immersive and realistic interview simulation experience.

4. METHODOLOGY:

A. Introduction

This section explains how the proposed system, CareerMate AI, was designed and developed. The methodology focuses on the overall system structure, how the interview process works, and how different AI techniques are used to evaluate candidates.

The system is built using a modular and scalable approach. It combines Natural Language Processing (NLP), computer vision, and speech analysis to create a realistic interview experience. By analyzing text, behavior, and speech together, the system provides a more complete and accurate assessment of a candidate's performance.

B. Proposed System

CareerMate AI is designed to simulate real interview environments and help users practice effectively. The system allows users to attend mock interviews that are tailored to their resume or job role.

During the interview, user responses are collected in multiple forms, including text, audio, and video. An AI avatar powered by AKOOL asks questions in a human-like way, making the interaction more engaging and realistic. The system then analyzes these responses using different AI techniques and generates performance scores along with useful feedback to help users improve.

C. System Architecture

The system is organized into multiple layers, each handling a specific function:

- The Presentation Layer manages the user interface and interaction.
- The Application Layer handles backend logic, session control, and communication between components.
- The AI & Analysis Layer processes user responses using NLP, behavioral analysis, and speech analysis.
- The Database Layer stores user data, interview responses, and results.

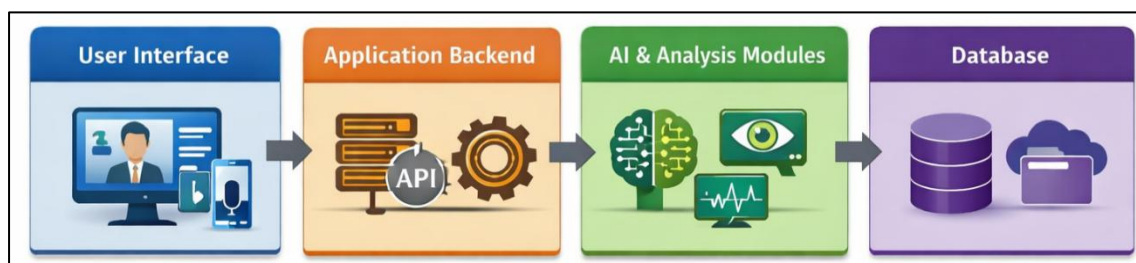


Figure 4.1: System Architecture of CareerMate AI

This layered design makes the system easy to manage, scalable, and flexible for future improvements.

D. Methodological Framework

The overall workflow of the system follows a clear sequence of steps:

1. The user registers and sets up their profile



2. A mock interview session is started
3. Questions are generated dynamically
4. User responses are captured (text, audio, video)
5. Responses are analyzed using AI techniques
6. A performance score is calculated
7. Feedback is generated and shown to the user

This process ensures a smooth and realistic interview experience.

E. Dataset Description

The system works with both structured and unstructured data. It uses different types of information to evaluate performance, such as:

- User details and resume content
- Extracted skills and experience level
- Text responses for NLP analysis
- Speech features like tone and pauses
- Visual cues such as eye contact and posture
- Response time to measure preparedness

All these inputs help the system perform a detailed and accurate evaluation.

F. Algorithmic Workflow

The system follows a step-by-step process during execution:

- Start the interview session
- Generate questions based on context
- Capture user responses
- Analyze text using NLP
- Extract behavioral features from video
- Analyze speech patterns
- Calculate the final score
- Store results and display feedback

This structured workflow ensures consistency and efficiency in evaluation.

G. Mathematical Model

The overall performance of a candidate is calculated using a weighted scoring approach:

$$P = w_1 C + w_2 B + w_3 S + w_4 R + w_5 G$$

Here:

- C - represents content quality
- B - represents behavioral performance
- S - represents speech quality
- R - represents relevance
- G - represents grammar

The weights are assigned such that their total equals 1, ensuring a balanced evaluation across all factors.

H. Module Design

The system is divided into several modules, each responsible for a specific task:

- User Management Module
- Interview Management Module
- NLP Evaluation Module
- Behavioral Analysis Module
- Speech Analysis Module
- Scoring Module
- Feedback Module

This modular approach makes the system easier to develop, test, and expand.

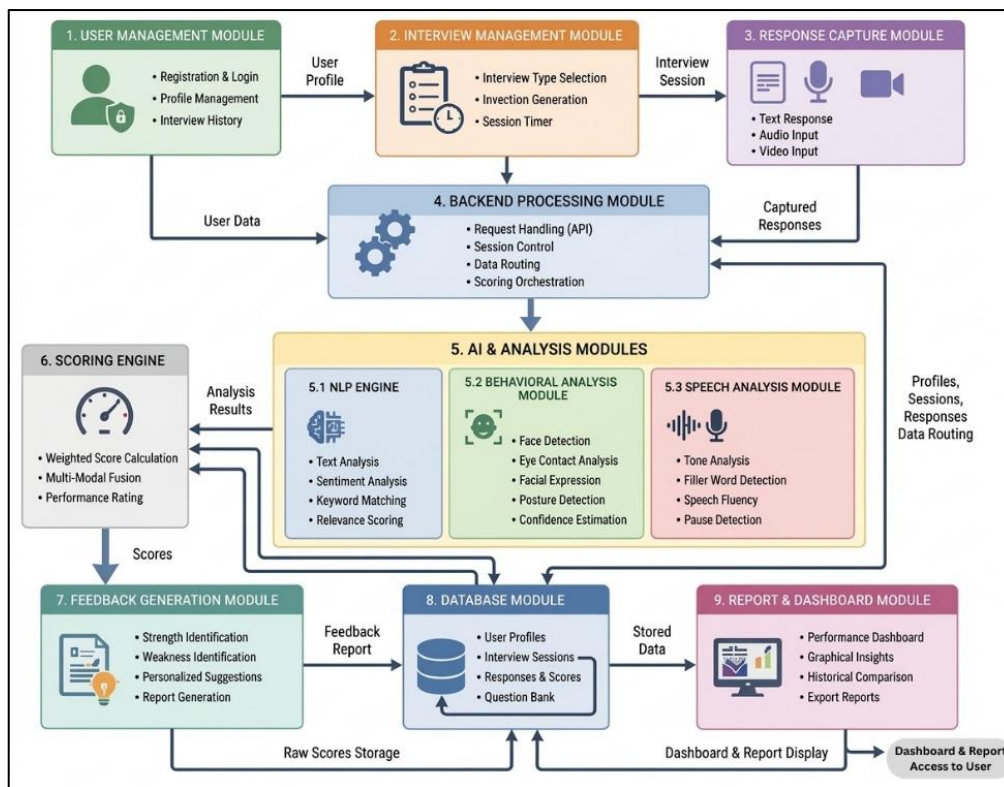


Figure 4.2: Module Design Diagram

The module design diagram illustrates the interaction between all system modules. The flow begins with user input through the interface, which is processed by the backend and passed to AI modules for analysis. The results are then stored in the database and presented to the user in the form of feedback.

I. Technology Stack

The system uses modern technologies for efficient development and performance:

Component	Technologies Used
Frontend	React, HTML, CSS
Backend	Flask, REST APIs
NLP	NLTK, Transformer Models
Computer Vision	OpenCV
Speech Processing	Speech Recognition Libraries
Machine Learning	TensorFlow, Scikit-learn
Database	MySQL / MongoDB
Avatar	AKOOL

J. Advantages of the Proposed System

- Provides a complete evaluation using multiple input types
- Offers real-time feedback for improvement
- Delivers personalized interview experiences
- Uses AI avatars for realistic interaction
- Ensures fair and unbiased scoring
- Supports future upgrades and scalability

In this section, the methodology of CareerMate AI has been explained in detail. The system combines NLP, behavioral analysis, and speech processing to evaluate candidates effectively.

The modular and scalable design ensures that the platform can handle real-time interactions and can be enhanced further in the future.

5. RESULTS:

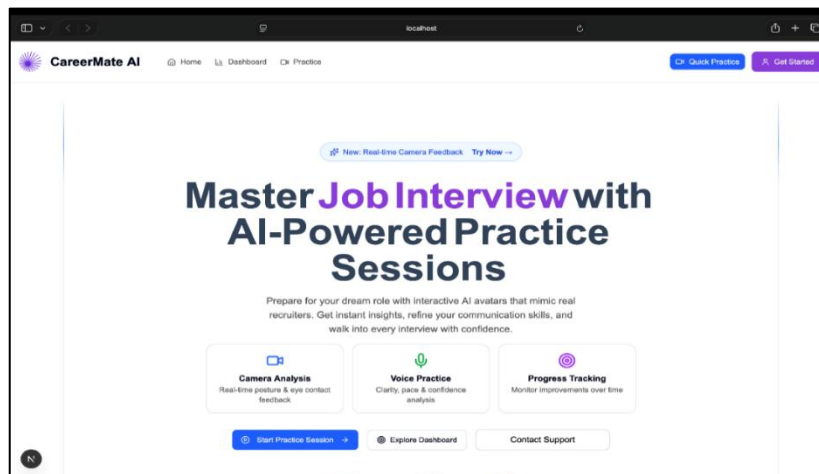


Figure 5.1: Interactive Web-Based User Interface of CareerMate AI for Real-Time Interview Assistance

This figure illustrates the web user interface of CareerMate AI, designed to provide a seamless and interactive experience for users. It enables resume upload, interview session setup, and real-time video/audio interaction, while displaying live feedback, performance metrics, and AI-driven insights through an intuitive dashboard layout.

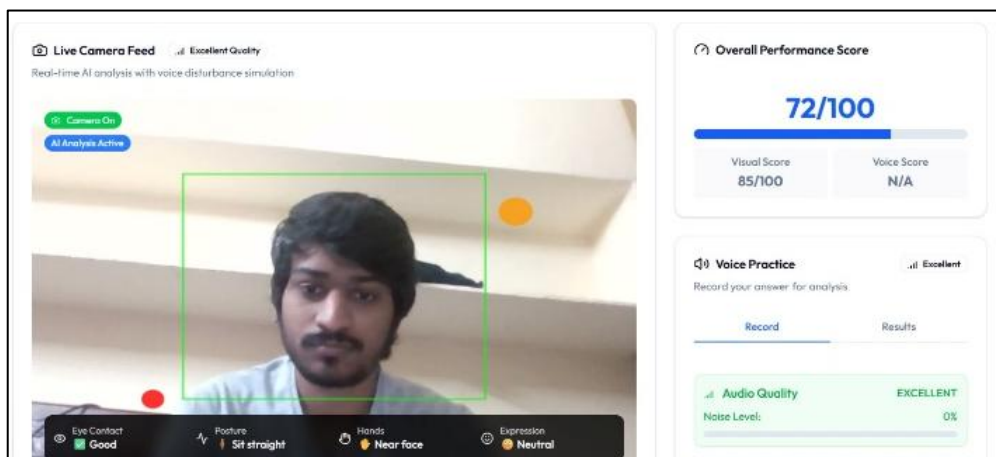


Figure 5.2: Behavioral Analysis Results

Observation: Behavioral analysis was effective under proper lighting conditions. Minor accuracy variations occurred when webcam quality was low or lighting was insufficient.



Figure 5.3: Speech Analysis Results

Observation: Clear and fluent speakers scored higher, while hesitation reduced scores.



6. DISCUSSION :

The experimental evaluation and user testing of the CareerMate AI system provide valuable insights into both its effectiveness and its practical limitations. Overall, the system demonstrates strong potential as an AI-driven interview assistance platform, particularly due to its ability to combine multiple analysis techniques into a single, unified framework. One of the most significant observations is the system's ability to perform semantic evaluation of responses rather than relying on exact keyword matching. This makes the evaluation process more flexible and realistic, as candidates are assessed based on the meaning of their answers. Such an approach aligns more closely with real-world interview scenarios, where different phrasings can convey the same idea. Another key strength lies in the system's multimodal analysis capability. By integrating natural language processing, computer vision, and speech analysis, the platform goes beyond traditional text-based evaluation systems. This allows it to assess not only technical knowledge but also behavioral and communication aspects, providing a more holistic understanding of candidate performance. This integrated approach was found to enhance the overall reliability of the evaluation process. The real-time feedback mechanism also plays an important role in improving user learning outcomes. Users can immediately identify mistakes, adjust their responses, and track their improvement over time. This iterative learning process makes the system particularly useful for students and job seekers preparing for interviews.

In addition, the system ensures consistent and objective scoring, as the evaluation process is data-driven and free from human bias. This consistency was evident during repeated testing, where similar responses produced similar scores. Such reliability is essential for building user trust in AI-based assessment systems.

From a usability perspective, the user-friendly interface contributes significantly to user engagement. The structured interview flow, clear instructions, and interactive dashboard make the system accessible even for users with minimal technical background. Furthermore, the modular architecture of the system supports scalability and future enhancements, making it adaptable to evolving AI technologies.

However, the discussion also highlights several limitations. The system's performance in behavioral analysis is highly dependent on environmental conditions, such as lighting and camera quality. This indicates that real-world deployment may require controlled conditions or improved preprocessing techniques to ensure consistent performance.

Another limitation is the restricted understanding of highly abstract or creative responses. Since the NLP module relies on semantic similarity and predefined patterns, it may not fully capture deep contextual meaning or unconventional answers. This suggests a need for more advanced language models or contextual reasoning capabilities in future improvements. The system also shows some dependency on computational resources, with minor delays observed under heavy load conditions. This emphasizes the importance of optimizing backend performance and ensuring adequate infrastructure for real-time applications.

Similarly, speech recognition variability remains a challenge, as factors such as background noise, accent differences, and microphone quality can affect accuracy. Addressing these issues would require more robust speech models and noise-handling techniques.

Finally, while the system provides objective evaluation, it still lacks human-level judgment and intuition. It cannot fully interpret emotional nuances or complex real-world contexts, which are often critical in interviews. Therefore, the system is better viewed as a supportive tool rather than a complete replacement for human interviewers.

7. CONCLUSION:

The rapid growth of Artificial Intelligence has brought major changes across many fields, especially in recruitment and career preparation. In this context, the development of CareerMate AI: An AI-Driven Real-Time Interview Assistance System Using Behavioral and Visual Cues stands out as a meaningful step toward smarter and more effective interview training solutions.

The system combines powerful technologies such as Natural Language Processing (NLP), computer vision, and speech analysis to create a realistic interview environment. Unlike traditional mock interview platforms that mainly focus on basic question-and-answer practice, CareerMate AI goes a step further by evaluating candidates through multiple aspects. It not only analyzes what the user says but also how they behave and communicate, making the overall assessment more accurate and practical.

During implementation and testing, the system showed strong performance in generating dynamic interview questions, evaluating responses based on meaning, and analyzing behavioral factors like eye contact and posture. It also effectively assessed speech clarity and fluency, which are critical in real interviews. One of the key strengths of the system is its ability to provide structured and meaningful feedback, helping users clearly understand their strengths and areas for improvement.



The addition of speech analysis makes the platform more complete, as communication skills play a major role in interview success. Furthermore, the modular and scalable design of the system ensures that it can be easily improved in the future, such as by adding personalization features or integrating with other platforms.

However, like any system, it has some limitations. The accuracy of behavioral analysis can be affected by environmental conditions like lighting or camera quality, and the system may find it challenging to fully understand highly creative or abstract responses. Despite these challenges, the overall performance and usefulness of the system remain strong.

In conclusion, CareerMate AI successfully bridges the gap between theoretical preparation and real-world interview performance. By providing real-time feedback, objective evaluation, and continuous performance tracking, it offers a more practical and engaging way for users to prepare for interviews. This project clearly demonstrates how multiple AI technologies can be combined to build an intelligent and impactful interview preparation system with strong potential for real-world applications.

8. LIMITATIONS:

A. Sensitivity to Environmental Conditions: Behavioral analysis performance depends heavily on:

- Lighting conditions
- Camera quality
- Background environment

Poor lighting or low-resolution webcams may reduce detection accuracy.

B. Limited Understanding of Abstract Responses: The NLP module relies on predefined patterns and semantic similarity. As a result:

- Highly creative or unconventional answers may receive lower scores
- Contextual depth may not always be fully captured

C. Dependency on System Resources: Under heavy load conditions:

- Slight delays were observed in response evaluation
- Real-time performance may degrade if server resources are limited

D. Speech Recognition Variability: Speech analysis may be affected by:

- Background noise
- Accent variations
- Microphone quality

This can slightly impact speech scoring accuracy.

E. Lack of Human-Level Judgment: While the system is objective, it cannot:

- Interpret emotional nuances deeply
- Understand complex real-world contexts
- Replace human interviewer intuition

REFERENCES:

1. P. Chavan and S. Jadhav (2026): A general paper on AI based mock interview system. *International Journal of Scientific Research in Science, Engineering and Technology*.
<https://doi.org/10.32628/IJSRSET26137>
2. H. Koshti, P. Gosavi, R. Pagar, P. Khairnar, and S. Talekar (2025): AI-powered interview preparation system: Integrating resume analysis, HR simulation, and technical skill assessment. *Journal of Engineering Research and Reports*.
3. K. K. Jain, R. Sai, G. R. S. Charan, and V. A. Narayana (2024): AI interviewer chatbot for technical and HR brilliance: A tool for upskilling candidate. *International Journal of Engineering Research & Technology*, 13(2).
<https://zenodo.org/records/18170937>
4. A. Sahu, R. K. Khare, Y. R. Singh, and Y. Sahu (2025): AI interviewer using generative AI. *Proc. International Conference on Advances and Applications in Artificial Intelligence (ICAAAI)*.
5. P. Jaybhaye, H. Koli, N. Thakkar, O. Latkar, and M. S. Patil (2026): Personalized AI-based interview preparation and evaluation system. *International Journal of Science, Engineering and Technology*, 14(1).



6. S. Samrose and E. Hoque (2022): MIA: Motivational interviewing agent for improving conversational skills in remote group discussions. *Proceedings of the ACM on Human-Computer Interaction*, 6(CSCW2), 1–25.
<https://doi.org/10.1145/3492864>
7. N. S. Rai, A. Padthe, and H. N. R. (2024): AI based interview evaluator: An emotion and confidence classifier. *International Advanced Research Journal in Science, Engineering and Technology*, 11(4), 299–304.
8. R. Kumar, P. Sharma, and S. +--Verma (2022): AI-based mock interview evaluator: An emotion and confidence classifier model. *International Journal of Engineering Research & Technology*.
<https://doi.org/10.5281/zenodo.18073388>
9. B. W. Schuller, S. Steidl, A. Batliner, et al. (2018): The INTERSPEECH 2018 computational paralinguistics challenge: Atypical & self-assessed affect, crying & heart beats. *Proc. INTERSPEECH*.
10. Bukya Ravi, G. Madhu Mohan, and M. Kumar Swamy (2024): Artificial intelligence role in optimizing electric vehicle charging patterns reduce costs and improve overall efficiency: A review. *Journal of Engineering, Management and Information Technology*, 2(3), 129–138.
11. H.-Y. Suen, K.-E. Hung, and C.-L. Lin (2020): Intelligent video interview agent used to predict communication skill and perceived personality traits. *Human-Centric Computing and Information Sciences*, 10(3).
<https://doi.org/10.1186/s13673-020-0208-3>
12. Z. Xiao, J. Song, et al. (2020): If I hear you correctly: Building and evaluating interview chatbots with active listening skills. *Proc. ACM CHI Conference on Human Factors in Computing Systems*.
<https://dl.acm.org/doi/10.1145/3313831.3376131>
13. A. Agrawal, R. A. George, S. S. Ravi, S. Kamath, and A. Kumar (2020): Leveraging multimodal behavioral analytics for automated job interview performance assessment and feedback. *Proc. ACL Workshop on Multimodal Language*.
<https://aclanthology.org/2020.challengehml-1.6/>
14. S. Poria, E. Cambria, R. Bajpai, and A. Hussain (2017): A review of affective computing: From unimodal analysis to multimodal fusion. *Information Fusion*, 37, 98–125.
15. B. Schuller, S. Steidl, A. Batliner, et al. (2013): Paralinguistics in speech and language—State-of-the-art and the challenge. *Computer Speech & Language*, 27(1), 4–39.
<https://doi.org/10.1016/j.csl.2012.02.005>
16. H.-Y. Suen, K.-E. Hung, and C.-L. Lin (2021): Intelligent video interview agent used to predict communication skill and perceived personality traits. *Journal of Ambient Intelligence and Humanized Computing*.
17. S. Rasipuram and D. B. Jayagopi (2018): Automatic assessment of communication skill in interview-based interactions. *Multimedia Tools and Applications*, 77, 18709–18739.
<https://link.springer.com/article/10.1007/s11042-018-5654-9>